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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/532,084	04/21/2005	Takashi Yasumura	80346(47762)	6480
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EXAMINER				
WU, IVES J				
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

**Office Action Summary****Application No.**

10/532,084

**Applicant(s)**

YASUMURA ET AL.

**Examiner**

IVES WU

**Art Unit**

1797

**Period for Reply** -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 17 June 2009.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-3, 5 and 8-20 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-3, 5, 8-20 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-8508)
- 4) ☐ Interview Summary (PTO-413)
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_
- Paper No(s)/Mail Date \_\_\_\_\_

### DETAILED ACTION

(1). Applicants' Remarks filed on 6/17/2009 has been received.

The rejections of claims 1-3, 5-20 in the prior Office Action dated 2/17/2009 is revised in view of present Amendments.

#### *Claim Rejections - 35 USC § 103*

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

(2). **Claims 1-3, 8-20** are rejected under 35 U.S.C. 103(a) as being unpatentable over Okumura et al (US20020055030A1) in view of Butler (US6251308B1), evidenced by Fujimoto et al (WO02/44285) relied on English Translation (US07132460B2).

As to component (A) of a conductive filler in a conductive resin composition in **independent claim 1**, Okumura et al (US20020055030A1) disclose the electro-conductive agent, a variety of components such as carbon powders, carbon fibers and metal powders can be employed ([0015], line 1-7).

As to component (C) of a (meth)acrylate to be a reaction product obtained by reacting a polyetherpolyol having an aromatic cyclic structural unit and/or an aliphatic cyclic structural unit with a (meth)acrylic acid, or a reaction product obtained by reacting a polyisocyanate having an aromatic cyclic structural unit and/or an aliphatic structural unit with a polyetherpolyol having an aromatic cyclic structural unit and/or an aliphatic cyclic structural unit under the conditions that an isocyanate group of the polyisocyanate is in excess of a hydroxyl group of polyol, with a (meth)acrylate having a hydroxyl group in **independent claim 1**, Okumura et al (US20020055030A1) disclose urethane (meth)acrylate formed by polyurethane oligomer and hydroxyC<sub>2-6</sub>alkyl (meth)acrylate. The polyurethane oligomer includes a reaction product of diisocyanate and polyether diols such as polyoxyC<sub>2-4</sub>alkylene glycols, as evidenced by Fujimoto et al (US 7132460B2) that polyether diols such as polyethylene glycol, polybutylene glycol, 1,2-cyclohexanedimethanol, 1,3-cyclohexanedimethanol, cyclohexanediol (Col. 3, line 57- Col. 4, line 1), therefore, the polyether diols of Okumura et al (US 20020055030A1) would include aliphatic cyclic structural unit. The molar ratio of hydroxyl group to isocyanate group of the

urethane oligomer is about 0.7/1 to 1.2/1 ([0049]). Therefore, the excess isocyanate group would completely reacted with hydroxyl group of (meth)acrylate, so that no active hydrogen atom is left.

As to the component (C) of a (meth)acrylate having a  $M_n$  of 500 to 10,000, which containing 20 to 80 wt% of an aromatic cyclic structural unit in **independent claim 1**, in view of substantially identical (meth)acrylate disclosed by prior art, and by applicants, it is examiner's position to believe that the (meth)acrylate of prior art would inherently possess  $M_n$  and aromatic structural unit as claimed. Since USPTO does not have facilities necessary to conduct the measurements. The burden now is shifted to applicants to prove otherwise. *In re Best*, 562 F.2d 1252, 195 USPQ 430 (CCPA 1977).

As to component (B) a urethane-modified epoxy (meth)acrylate obtained by reacting an epoxy (meth)acrylate (b-1) with a polyisocyanate (b-2); the epoxy (meth)acrylate (b-1) being obtained by an addition reaction of an epoxy resin having an aromatic cyclic structural unit and/or an aliphatic cyclic structural unit and a (meth)acrylic acid in a conductive resin composition in **independent claim 1**, Okumura et al (US20020055030A1) disclose radical-polymerizable resins, for example, vinyl ester-series resins, urethane (meth)acrylates and the like, **can be used singly or in combination** ([0018]). Vinyl-ester series Resin (e.g., epoxy (meth) acrylate) is a ring-opening and addition reaction product of an epoxy group with a carboxyl group of a compound having a  $\alpha$ ,  $\beta$ -ethylenically unsaturated bond, and is an oligomer having a  $\alpha$ ,  $\beta$ -ethylenically unsaturated bond such as (meth)acryloyl group at its terminal position ([0020]. As the alicyclic epoxy resin, there may be mentioned, for example, alicyclic epoxy acetal, alicyclic diepoxy adipate and the like ([0025]). Okumura et al (US20030055030A1) **do not teach** the urethane-modified epoxy (meth)acrylate as claimed.

However, Butler (US 6251308B1) **teaches** highly conductive molding compounds and fuel cell bipolar plates comprising these compounds (Title). One component of a molding resin composition is a cross-linkable prepolymer such as an unsaturated polyester resin or **vinyl ester resin** (Col. 4, line 1-3). In general, the vinyl ester resins that can be used are the reaction products of epoxy resins and a monofunctional ethylenically unsaturated carboxylic acid. More specifically, these vinyl ester resins are the reaction product of an epoxy terminated oligomer, for example, an epoxy functionalized bisphenol A with an acrylic acid, or methacrylic acid forming

acrylic terminal groups on the oligomer. The vinyl esters have predominantly terminal unsaturation while the unsaturated polyesters have predominantly internal unsaturation (Col. 4, line 15-24). An essential component to the improved molding composition is a rheological modifier, which may act to increase the molecular weight such as by chain extension of the resin prepolymer. Suitable modifiers include polyisocyanates. It is believed that the foregoing **modifiers act chemically by co-reacting into the polymer backbone at carboxy or hydroxyl sites** (Col. 5, line 20-27). The modifiers are further used in general to enable the achievement of a high definition conductive polymeric fuel cell plate (Col. 5, line 40-42). Resin A is Hetron 922 available from Ashland Chemical Co. in Columbus Ohio. It is a low viscosity epoxy vinyl ester resin (Col. 7, line 54-57).

The advantage of urethane-modified vinyl-ester resin is to get a higher glass transition temperature and resulted in an improvement in the hot strength of the molded part. Further improvement are also possible by optimizing both gel time and cure time for the prepolymer by controlling initiator type and amount (Col. 3, line 35-41). Further these compositions enable the production of thin and intricate specimens that have high concentrations of conductive filler (Col. 3, line 59-61). In this application they are used to modify the resin structure to prevent phase separation of the resin from the conductive filler (in particular in view of the high loadings of the conductive filler, i.e. over 50% or even 65% by weight or more of graphite). The modifiers are further used in general to enable the achievement of a high definition conductive polymeric fuel cell plate (Col. 5, line 36-42).

Therefore, it would have been obvious to use urethane-modified vinyl ester resin disclosed by Butler for the vinyl-ester resin of Okumura et al for a combination with Urethane (meth)acrylate in order to attain the above-cited advantages.

As to component (D) of other ethylenically unsaturated monomer in **independent claim 1**, and **claim 11**, Okumura et al (US20020055030A1) radical-polymerizable diluent such as aromatic vinyl ester, in particular, styrene ([0058]-[0060]).

As to the epoxy(meth)acrylate having a hydroxyl value in the range of 100 to 300, the molar ratio of moles of hydroxyl group of the epoxy (meth)acrylate to moles of isocyanate group of the polyisocyanate being within the range of 1.0/(0.5 to 1.5) in **independent claim 1**, Butler (US06251308B1) discloses desirable amounts of polyisocyanate modifiers to be from about 1 to

about 15 weight percent. This can also be expressed as from about 0.5 to about 20 phr (Col. 6, line 7-13), it would meet the range of mole ratio as claimed. In view of the substantially identical epoxy (meth)acrylate disclosed by Applicants, and by prior art, it is examiner's position to believe that the epoxy (meth)acrylate of prior art would inherently possess the hydroxyl value in the range of 100 to 300 as claimed. Since USPTO does not have facilities necessary to conduct the measurements. The burden now is shifted to applicants to prove otherwise. *In re Best*, 562 F.2d 1252, 195 USPQ 430 (CCPA 1977).

As to the limitation of **claims 2 and 3**, Okumura et al disclose the novolac type epoxy and other type of epoxy resin in paragraph (3) which includes 30 to 90 wt% of an aromatic cyclic structural unit and/or an aliphatic cyclic structural unit.

As to the limitation of **claim 8**, in absence of showing the criticality of the records, the optimization value of ratio between component (b) of urethane-modified epoxy (meth)acrylate and component (c) of (meth)acrylate to be 95/5 to 50/50 in a known process renders *prima facie obviousness* within one ordinary skill in the art. *In re Boesch*, 617 F.2d, 276, 205 USPQ 215, 219 (CCPA 1980).

As to the limitation of **claim 9**, Okumura et al disclose the wt ratio of the electroconductive agent to the radical-polymerizable thermosetting resin system is from 55/45 to 95/5 ([0063], line 1-3), in other words, the content of component A is to be 55 to 95 wt%.

**Claim 10** is rejected under 35 U.S.C. 103(a) as being unpatentable over Okumura et al (US20020055030A1).

As to the limitation of **claim 10**, Okumura et al disclose the thermosetting to be 12 wt%, reactive diluent (styrene) to be 8 wt%, conductive fillers to be 80 wt% in Example 2, it would be obvious to have the distribution of components B, C such as 6 wt% of B and 4 wt% of urethane-(meth)acrylate C taught by Okumura to be within 12 wt% and to meet the instant claim.

As to limitation of **claims 13-20**, Okumura et al disclose the separator for solid polymer-type fuel cell being produced by molding the resin composition which comprises an electroconductive agent and a radical-polymerizable thermosetting resin system and a resin molding method (Abstract, line 1-4).

As to components (A) – (D) in 1<sup>st</sup> step method for producing a conductive resin composition in **independent claim 12**, the disclosure of Okumura et al is incorporated herein by

reference, the most subject matters of components, and hydroxyl values, molar ratio as currently claimed, have been recited in applicants' claim 1, and have been discussed therein.

As to kneading step in the method in **independent claim 12**, Okumura et al disclose the resin composition is kneaded with the use of conventional kneader ([0082], line 1-2).

As to 2<sup>nd</sup> step of reacting the kneaded mixture at a temperature of room temperature to 80 °C in the method in **independent claim 12**, Okumura et al disclose the reaction for 8 hours at 120 °C in Example 1. In absence of showing the criticality of the records, the optimized reaction temperature ranged from room temperature to 80 °C in the known process renders *prima facie obviousness* within one of ordinary skills in the art. *In re Boesch*, 617 F.2d 272, 276, 205 USPQ 215, 219 (CCPA 1980).

(3). **Claim 5** is rejected under 35 U.S.C. 103(a) as being unpatentable over Okumura et al (US20020055030A1) in view of Butler (US06251308B1), further in view of Numa et al (US05886082A) for the same rationale recited in prior Office Action dated 8/11/2008.

#### ***Response to Arguments***

(4). Applicant's arguments filed on 6/17/2009 concerning the radical-polymerizable resins usually having a plurality of  $\alpha$ ,  $\beta$ -ethylenically unsaturated bonds, in addition, it is also clear that only vinyl ester resin is used in Examples in Okumura et al (US 20020055030A1) and there is no Example that only urethane acrylate is used or both urethane acrylate and vinyl ester resin are used (§ 4, 5, page 5, Remarks) have been fully considered but they are not persuasive. The vinyl series resin disclosed by Butler (US 6251308B1) includes the species formed by reaction of epoxy resin and methacrylic acid, therefore, it would contain  $\alpha$ ,  $\beta$ -ethylenical unsaturated bond even though it has predominantly terminal unsaturation (Col. 4, line 22-23). Furthermore, Disclosed examples and preferred embodiments do not constitute a teaching away from a broader disclosure or nonpreferred embodiments. *In re Susi*, 440 F.2d 442, 169 USPQ 423 (CCPA 1971).

Applicant's arguments, see page 1-3, Remarks), filed on 6/17/2009, with respect to the rejection(s) of claim(s) 1 under Okumura et al (US 2002/0055030A1) about the polycarbonate

diols (different from polyether diols) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection also is made in view of Okumura et al (US 2002/0055030A1) based on teaching of polyether diols.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to IVES WU whose telephone number is (571)272-4245. The examiner can normally be reached on 8:00 - 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Duane Smith can be reached on 571-272-1166. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Examiner: Ives Wu

Art Unit: 1797

Date: September 21, 2009

/DUANE SMITH/  
Supervisory Patent Examiner, Art Unit 1797